

# Esophagojejunostomy With Manual Single Layer Suturing After a Total Gastrectomy for Gastric Cancer

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**Background:** We wished to verify the clinical usefulness of manually performed single layer suturing for an esophagojejunostomy after a total gastrectomy versus stapled suturing.

**Methods:** We compared retrospectively 24 patients who underwent manual single layer suturing with 38 patients who underwent stapled suturing.

**Results:** Anastomotic leakage was seen in one patient (4%) with single layer suturing and one patient (3%) with stapled suturing. No anastomotic stenosis was seen in the patients with single layer suturing. There was no difference in the operative time, blood loss, postoperative days for oral intake, or the length of hospital stay between the patients with single layer suturing and those with stapled suturing.

**Conclusions:** Manual single layer suturing is considered to be as safe as stapled suturing and is also thought to be clinically useful in reducing anastomotic failure for esophagojejunostomy.

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**KEY WORDS:** stapled suturing; complication; transabdominal approach

## INTRODUCTION

Since esophagojejunostomy with a transabdominal approach after a total gastrectomy is performed in a narrow and deep operative field at the diaphragmatic hiatus, the surgeon is thus confronted with a high risk for anastomotic failure. The introduction of mechanical stapling devices have resulted in a lower incidence of anastomotic complications [1–3], and various modifications for mechanical anastomosis also have been made to obtain better results in esophagojejunostomy [4,5]. However, few attempts have been made to improve manual suturing for esophagojejunostomy in recent years, despite the fact that manual suturing remains the basic surgical technique for anastomosis. In this study we have attempted manually to perform single layer suturing for esophagojejunostomy after a total gastrectomy. In order to verify the clinical usefulness of single layer suturing, we also compared this technique with EEA (US Surgical Corporation, Norwalk, CT) stapling techniques.

## MATERIALS AND METHODS

Sixty-two patients, who underwent total gastrectomy with a transabdominal approach for gastric cancer from January 1991 to October 1995 at Iizuka Hospital, were retrospectively studied. The patients were divided into two groups according to the anastomotic techniques used for esophagojejunostomy: 24 patients underwent manual single layer suturing and 38 patients underwent EEA stapling. The manual single layer sutured anastomosis was performed with an interrupted 3-0 absorbable synthetic monofilament suture along the entire wall. For the stapled anastomosis, a purse-string suture was made around the cut end of the esophagus either manually or with a purse-string device. The cartridge without the anvil was inserted through the open jejunum end, and then

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**TABLE I. Performed Operations for Gastric Cancer Patients in Single Layer Suturing and Stapled Suturing**

| Operation   | Single layer<br>(n = 24) | Stapled<br>(n = 38) |
|---|--------------------------|---------------------|
| Combined resection of<br>adjacent organs –<br>adjacent organs + | 16<br>8                  | 32<br>16            |

the central rod was made to emerge through the antimesenteric wall. After attaching the anvil to the central rod, the former was introduced into the esophagus, and the purse-string suture was tied. Regardless of the suturing technique employed, all 62 patients underwent end-to-side anastomosis for esophagojejunostomy after a total gastrectomy.

The adjacent organs were resected (Table I) in 8 of 24 patients (33%) with single layer suturing (splenectomy: 4; splenectomy + distal pancreatectomy: 3; splenectomy + distal pancreatectomy + transverse colectomy: 1). In 38 patients with stapled suturing 16 (42%) underwent a total gastrectomy combined with a resection of the adjacent organs (splenectomy: 4; transverse colectomy: 1; hepatectomy: 1; splenectomy + distal pancreatectomy: 7; splenectomy + distal pancreatectomy + transverse colectomy: 3). Reconstruction after a total gastrectomy in the single layer suturing group was performed by Roux-en-Y loop anastomosis in 10 patients and Roux-en-Y anastomosis in 14 patients. In the stapled suturing group, 14 patients were reconstructed by Roux-en-Y loop anastomosis, 18 by Roux-en-Y anastomosis, and 6 by jejunal interposition. All esophagojejunostomy complications were diagnosed by either a barium study or endoscopy. In 62 patients treated by a total gastrectomy, four patients (3%) had complications that were not directly associated with the esophagojejunostomy, one had leakage of the jejunojejunostomy, one had a liver abscess, one had ileus, and one had enterocolitis with a methicillin resistant staphylococcus aureus (MRSA) infection. Therefore, these four complications were excluded from the complications attributed to esophagojejunostomy.

The statistical analyses were carried out using both Student's *t*-test and the Chi-square test.

## RESULTS

With regard to age, sex, and cancer stage, no significance was observed between the group with single layer suturing and that with stapled suturing (Table II). Preoperative blood analyses were also compared between the two groups (Table III). There was no significant difference in the mean values of hemoglobin, albumin, blood urea nitrogen, creatinine, and total bilirubin between the two groups. There was no statistically significant difference between the two groups with respect to the mean operation time, mean blood loss, mean postoperative

**TABLE II. Incidence of Age, Sex, and Stage in Gastric Cancer Patients With Single Layer Suturing and Stapled Suturing**

| Factor    | Single layer<br>(n = 24) | Stapled<br>(n = 38) | <i>P</i> value |
|-----------|--------------------------|---------------------|----------------|
| Age       | 63.1 (41–75)             | 64.5 (39–83)        | NS             |
| Sex       |                          |                     | NS             |
| Male      | 12                       | 22                  |                |
| Female    | 12                       | 16                  |                |
| Stage     |                          |                     | NS             |
| I or II   | 10                       | 21                  |                |
| III or IV | 14                       | 17                  |                |

Numbers in parentheses: range.

NS: not significant.

**TABLE III. Preoperative Blood Counts and Biochemical Values for Gastric Cancer Patients With Single Layer Suturing and Stapled Suturing**

| Factors                        | Mean value (range)       |                     | <i>P</i> value |
|--------------------------------|--------------------------|---------------------|----------------|
|                                | Single layer<br>(n = 24) | Stapled<br>(n = 38) |                |
| Hemoglobin (g/dl)              | 12.1 (7.4–16.0)          | 12.0 (6.9–15.7)     | NS             |
| Albumin (g/dl)                 | 4.1 (3.0–5.0)            | 3.8 (2.7–4.7)       | NS             |
| Blood urea nitrogen<br>(mg/dl) | 19.2 (13–64)             | 14.6 (7–33)         | NS             |
| Creatinine                     | 1.1 (0.5–6.9)            | 0.8 (0.3–1.7)       | NS             |
| Total bilirubin (mg/dl)        | 0.5 (0.2–1.1)            | 0.7 (0.2–3.7)       | NS             |

NS: not significant.

days for oral intake, or the mean hospital stay (Table IV). In 24 patients with single layer suturing, only one showed postoperative anastomotic leakage due to esophagojejunostomy. In 38 patients with stapled suturing, four (11%) showed complications due to esophagojejunostomy, one had leakage, two showed stenosis, and one showed intraoperative complications with EEA. Two patients with stenosis recovered easily through endoscopic examination and bougienage. The intraoperative complications in one patient was the result of an esophageal injury during the insertion of the anvil. Postoperative complications were then avoided by changing the technique from stapled suturing to manual suturing.

## DISCUSSION

Leakage from the esophagojejunal anastomosis frequently develops subdiaphragmatic sepsis and is thus the main reason for postoperative morbidity and death after a total gastrectomy [6,7]. Recently, EEA stapling devices have become widespread and are now recognized as standard equipment for gastrojejunostomy because: (1) they save time in anastomosis, (2) they create a good uniform anastomosis, and (3) they result in a low level of postoperative leakage. However, some problems with the EEA stapler have also been reported [1–3]. For example,

**TABLE IV. Comparison of Operative Time, Blood Loss, Oral Intake, and Hospital Days Between Gastric Cancer Patients With Single Layer Suturing and Stapled Suturing**

| Factor               | Mean value (range)       |                     | P value |
|----------------------|--------------------------|---------------------|---------|
|                      | Single layer<br>(n = 24) | Stapled<br>(n = 38) |         |
| Operation time (min) | 223 (179–320)            | 221 (135–485)       | NS      |
| Blood loss (ml)      | 481 (145–1060)           | 469 (60–1600)       | NS      |
| Oral intake (days)   | 8.5 (7–28)               | 8.3 (6–18)          | NS      |
| Hospital stay (days) | 34 (21–54)               | 36 (18–70)          | NS      |

NS: not significant.

a purse-string suture in the distal end of the esophagus is time-consuming, and the insertion of the device into a narrow esophagus often results in a tearing of the esophagus. Such factors in deep surgical wounds have thus been associated with postoperative leakage. With regard to single layer suturing for esophagojejunostomy, few studies have been made. Sannohe et al. [8] reported a 5% rate of anastomotic leakage with single layer suturing in gastric cancer patients using the transabdominal approach. In this study, single layer suturing demonstrated anastomotic leakage in 4% of patients, and there was no significant difference in anastomotic failure between single layer suturing and stapled suturing. Therefore, single layer suturing, which is a simple and easy procedure, is considered to be a reliable technique for a successful anastomosis in a narrow and deep operation field at the diaphragmatic hiatus.

The spread of mechanical anastomosis for esophagojejunostomy also may cause other problems, which can be seen in laparoscopic surgery [9] or mechanical anastomosis after colorectal resection [10]. First, the increased incidence of mechanical anastomosis reduces the opportunity for surgeons to practice sufficiently manual suturing. Manual suturing for esophagojejunostomy remains the basic technique for the gastrointestinal surgeon. Because a risk of tearing the esophagus with mechanical anastomosis has been reported [1], every surgeon using stapling devices also must master the technique of manual suturing in order to overcome any intraoperative trouble that may arise with mechanical anastomosis. Second, mechanical anastomosis using disposable devices costs more than hand-sutured anastomo-

sis [10], and probably increases the total cost for patients. Mechanical suturing with reusable devices was considered to contribute to the reduction of the total cost of patient care, because the mean hospital length decreases with the reduction of anastomotic failure. However, recent mechanical anastomosis for esophagojejunostomy is performed, using a combination of several expensive mechanical devices such as an EEA stapler with a purse-string device and GIA or TA55. These devices are now disposable, and the expense of these disposable devices may exceed the savings gained by reducing the length of the hospital stay. Our study showed no difference in the mean hospital stay between stapled anastomosis and manual anastomosis with single layer suturing. The use of disposable devices also raises environmental concerns. This report is not intended to oppose to the use of mechanical anastomosis; however, we note that manual single layer suturing as well as stapled suturing are both useful in reducing anastomotic failures for esophagojejunostomy and should thus both be accepted as standard procedures for esophagojejunostomy.

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